

What is claimed is:

1. A method for analyzing a loop interface failure comprising the steps of:

detecting per route that abnormalities occur in all loop interfaces which are multiplexed and to which devices  
5 are connected, and

when the abnormalities in the loop interfaces are detected, detaching all devices connected to at least one of the loop interfaces.

2. The method for analyzing a loop interface failure as claimed in claim 1, wherein the step of detecting the abnormalities in the loop interfaces includes the steps of:

detecting that receptions of commands have ceased,  
5 which commands are regularly transmitted through the loop interfaces to which the devices are connected,

informing the routes each other that the receptions of the commands have ceased, and

when detecting that receptions of the commands have  
10 ceased in all routes, detecting that abnormalities occur in all of the loop interfaces.

3. The method for analyzing a loop interface failure as claimed in claim 1, further comprising a step of

performing a loop diagnosis for identifying a faulty device  
by accessing from a route, in which all of the devices were  
5 detached from the loop interface so that the loop  
abnormality has been resolved, to another route.

4. The method for analyzing a loop interface failure  
as claimed in claim 3, further comprising the steps of:

when the loop abnormalities occur in all of the  
multiplexed loop interfaces, judging per route whether the  
5 loop abnormality is resolved in a certain period of time,  
and

when the loop abnormalities were resolved in the  
certain period of time, inquiring disk controlling means  
whether they detached all of the devices, and when all of  
10 the devices were detached by the disk controlling means,  
performing countermeasure processing against a double-route  
link failure including a loop diagnosis by the step of  
performing the loop diagnosis.

5. The method for analyzing a loop interface failure  
as claimed in claim 4, wherein the certain period of time  
is so set as a little longer than a period of time  
necessary for the disk controlling means to detach all of  
5 the devices when the loop abnormalities occur in all of the  
multiplexed loop interfaces.

6. The method for analyzing a loop interface failure as claimed in claim 3, wherein a device determined as faulty in the loop diagnosis is detached from the loop interface, and the loop interface is to be in use again.

5

7. The method for analyzing a loop interface failure as claimed in claim 6, wherein the loop diagnosis for identifying a faulty device is performed by accessing to disk controlling means connected to another loop interface via the disk controlling means connected to the loop interface which is in use again.

8. A program embodied in electrical signals, said program enabling a computer to execute each step as claimed in claim 1.

9. A computer-readable storage medium recording thereon a program which causes a computer to perform said steps of claim 1.

10. A system for analyzing a loop interface failure comprising:

loop connection switching means for connecting and detaching devices to and from multiplexed loop interfaces;

5 disk controlling means for controlling the loop  
connection switching means; and

a first interface for transmitting and receiving data  
each other between the disk controlling means; wherein

the disk controlling means have, when detecting that  
10 abnormalities occur in all of the loop interfaces,  
functions of outputting to the loop connection switching  
means instructions to detach all devices connected to at  
least one of the loop interfaces.

11. The system for analyzing a loop interface failure  
as claimed in claim 10, wherein the disk controlling means,  
when detecting that receptions of commands have ceased,  
which commands are regularly transmitted through loop  
5 interfaces to which devices managed by the disk controlling  
means are connected, inform via the first interface to  
another disk controlling means that the receptions of the  
commands have ceased, and

when detecting that receptions of commands have  
10 ceased in all disk controlling means, detect that  
abnormalities occur in all of the loop interfaces.

12. The system for analyzing a loop interface failure  
as claimed in claim 10, wherein the disk controlling means  
includes loop diagnostic means for performing a loop

diagnosis to identify a faulty device by accessing to disk  
5 controlling means connected to another loop interface via  
the disk controlling means connected to the loop interface  
in which all connected devices were detached so that the  
loop abnormality has been resolved.

13. The system for analyzing a loop interface failure  
as claimed in claim 12, wherein the loop diagnostic means  
detaches a device determined as faulty in the loop  
diagnosis from the loop interface so as to allow the loop  
5 interface to be in use again.

14. The system for analyzing a loop interface failure  
as claimed in claim 13, wherein the loop diagnostic means  
performs the loop diagnosis for identifying a faulty device  
by accessing to disk controlling means connected to another  
5 loop interface via the disk controlling means connected to  
the loop interface which is in use again.

15. The system for analyzing a loop interface failure  
as claimed in claim 10, further comprising:

enclosure service means which connects to the disk  
controlling means and to the devices through one loop  
5 interface of the multiplexed loop interfaces;

and a second interface for transmitting and receiving

data each other between the loop interface and another loop interface; wherein

the enclosure service means communicates with other  
10 enclosure service means, controls the loop connection  
switching means when abnormalities are detected in all of  
the loop interfaces so as to detach all devices connected  
to the loop interface.

16. The system for analyzing a loop interface failure  
as claimed in claim 15, wherein the enclosure service means  
includes, when detecting that a reception of commands has  
ceased, which commands are regularly transmitted through a  
5 loop interface to which devices managed by the enclosure  
service means are connected, means for informing via the  
second interface to another enclosure service means that  
the reception of commands has ceased, and

when detected that receptions of commands have ceased  
10 in all of the enclosure service means, detects that  
abnormalities occur in all of the loop interfaces.

17. The system for analyzing a loop interface failure  
as claimed in claim 15, wherein the enclosure service means,  
when the loop abnormalities occur in all of the multiplexed  
loop interfaces managed by the enclosure service means,  
5 judge whether the loop abnormalities are resolved in a

certain period of time, and when the loop abnormalities were resolved in the certain period of time, inquire the disk controlling means whether they detached all of the devices, and when all of the devices were detached by the  
10 controlling device, perform countermeasure processing against a double-route link failure including a loop diagnosis.

18. The system for analyzing a loop interface failure as claimed in claim 15, wherein the certain period of time is so set as a little longer than a period of time necessary for the disk controlling means to detach all of  
5 the devices when the loop abnormalities occur in all of the multiplexed loop interfaces.

19. The system for analyzing a loop interface failure as claimed in claim 10, wherein the loop interface is a Fibre Channel Arbitrated Loop (FC-AL).

20. The system for analyzing a loop interface failure as claimed in claim 10, wherein the devices are hard disk devices.

21. The system for analyzing a loop interface failure as claimed in claim 10, wherein the disk controlling means

monitors abnormalities in a plurality of loop interfaces.

22. The system for analyzing a loop interface failure as claimed in claim 15, wherein the enclosure service means monitors abnormalities in a plurality of loop interfaces.

23. A disk unit device, wherein the enclosure service means, the second service means, the loop connection switching means and the devices, which are claimed in claim 15, are detached from the disk controlling means as claimed  
5 in claim 10 to thereby form an independent disk unit means.

24. The disk unit device as claimed in claim 23, wherein the enclosure service means includes, when detecting that a reception of commands has ceased, which commands are regularly transmitted through a loop interface  
5 to which devices managed by the enclosure service means are connected, means for informing via the second interface to another enclosure service means that the reception of commands has ceased, and

when detected that receptions of commands have ceased  
10 in all of the enclosure service means, detects that abnormalities occur in all of the loop interfaces.

25. The disk unit device as claimed in claim 23,

wherein the loop interface is a Fibre Channel Arbitrated Loop (FC-AL).

26. The disk unit device as claimed in claim 23, wherein the devices are hard disk devices.

27. A program for letting a computer execute each means as claimed in claim 23.

5

10

15